

which and your eye, the rising smoak of some Chimney is interpos'd; which brings into my mind what I had once the opportunity to observe, which was, the Sun rising to my eye just over a Chimney that sent forth a copious stream of smoak; and taking a short *Telescope*, which I had then by me, I observ'd the body of the Sun, though it was but just peep'd above the Horizon, to have its underside, not onely flatted, and press'd inward, as it usually is when neer the Earth; but to appear more protuberant downwards then if it had suffered no refraction at all; and besides all this, the whole body of the Sun appear'd to tremble or dance, and the edges or limb to be very ragged or indented, undulating or waving, much in the manner of a flag in the Wind.

This I have likewise often observ'd in a hot Sunshiny Summer's day, that looking on an Object over a hot stone, or dry hot earth, I have found the Object to be undulated or shaken, much after the same manner. And if you look upon any remote Object through a *Telescope* (in a hot Summer's day especially) you shall find it likewise to appear tremulous. And further, if there chance to blow any wind, or that the air between you and the Object be in a motion or current, whereby the parts of it, both rarify'd and condens'd, are swiftly remov'd towards the right or left, if then you observe the Horizontal ridge of a Hill far distant, through a very good *Telescope*, you shall find it to wave much like the Sea, and those waves will appear to pass the same way with the wind.

From which, and many other Experiments, 'tis cleer that the lower Region of the Air, especially that part of it which lieth neereft to the Earth, has, for the most part, its constituent parcels variously agitated, either by heat or winds, by the first of which, some of them are made more rare, and so suffer a less refraction; others are interwoven, either with ascending or descending vapours; the former of which being more light, and so more rarify'd, have likewise a less refraction; the latter being more heave, and consequently more dense, have a greater.

Now, because that heat and cold are equally diffus'd every way; and that the further it is spread, the weaker it grows; hence it will follow, that the most part of the under Region of the Air will be made up of several kinds of *lentes*, some whereof will have the properties of *Convex*, others of *Concave glasses*; which, that I may the more intelligibly make out, we will suppose in the eighth *Figure* of the 37. *Scheme*, that A represents an ascending vapour, which, by reason of its being somewhat *Heterogeneous* to the ambient Air, is thereby thrust into a kind of Globular form, not any where terminated, but gradually finished, that is, it is most rarify'd in the middle about A, somewhat more condens'd about B B, more then that about C C; yet further, about D D, almost of the same density with the ambient Air about E E; and lastly, inclosed with the more dense Air F F, so that from A, to F F, there is a continual increase of density. The reason of which will be manifest, if we consider the rising vapour to be much warmer then the ambient heave Air; for by the coldness of the ambient Air, the shell E E will be more refrigerated then D D, and that then C C, which will be yet more then B B, and that more

more then A; so that from F to A, there is a continual increase of heat, and consequently of rarity; from whence it will necessarily follow, that the Rays of light will be inflected or refracted in it, in the same manner as they would be in a *Concave-glasse*; for the Rays G K I, G K I will be inflected by G K H, G K H, which will easily follow from what I before explained concerning the inflection of the *Atmosphere*.

On the other side, a descending vapour, or any part of the air included by an ascending vapour, will exhibit the same effects with a *Convex lens*; for, if we suppose, in the former *Figure*, the quite contrary constitution to that last describ'd; that is, the ambient Air F F being hotter then any part of that matter within any circle, therefore the coldest part must necessarily be A, as being farthest remov'd from the heat, all the intermediate spaces will be gradually discriminated by the continual mixture of heat and cold, so that it will be hotter at E E, then D D, in D D then C C, in C C then B B, and in B B then A. From which, a like refraction and condensation will follow; and consequently a lesser or greater refraction, so that every included part will refract more then the including, by which means the Rays, G K I, G K I, coming from a Starr, or some remote Object, are so inflected, that they will again concurr and meet, in the point M. By the interposition therefore of this descending vapour the visible body of the Starr, or other Object, is very much augmented, as by the former it was diminished.

From the quick consecutions of these two, one after another, between the Object and your eye, caused by their motion upwards or downwards, proceeding from their levity or gravity, or to the right or left, proceeding from the wind, a Starr may appear, now bigger, now less, then really it would otherwise without them; and this is that property of a Starr, which is commonly call'd twinkling, or scintillation.

The reason why a Starr will now appear of one colour, now of another, which for the most part happens when 'tis neer the Horizon, may very easily be deduc'd from its appearing now in the middle of the vapour, other whiles neer the edge; for if you look against the body of a Starr with a *Telescope* that has a pretty deep *Convex* Eye-glass, and so order it, that the Starr may appear sometimes in one place, and sometimes in another of it; you may perceive this or that particular colour to be predominant in the apparent *Figure* of the Starr, according as it is more or less remote from the middle of the *Lens*. This I had here further explain'd, but that it does more properly belong to another place.

I shall therefore onely add some few Quæries, which the consideration of these particulars hinted, and so finish this Section.

And the first I shall propound is, Whether there may not be made an artificial transparent body of an exact Globular *Figure* that shall so inflect or refract all the Rays, that, coming from one point, fall upon any *Hemisphere* of it; that every one of them may meet on the opposite side, and cross one another exactly in a point; and that it may do the like also with all the Rays that, coming from a lateral point, fall upon any other *Hemisphere*; for if so, there were to be hoped a perfection of *Dioptricks*,
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